Art. XIV.—*Medical History of the Expedition to the Niger, during the years* 1841–2, *comprising an account of the fever, which led to its abrupt termination.* By James Ormiston McWilliam, M. D., Surgeon of H. M. S. Albert, and senior medical officer of the expedition; with plates. London, 1843: pp. 287, 8vo.

Some Account of the African Remittent Fever, which occurred on board her majesty's steamship Wilberforce, in the river Niger, and whilst engaged on service on the western coast of Africa; comprising an Inquiry into the Causes of Disease in tropical climates. By Morris Pritchett, M. D., F. R. G. S., M. R. C. P., London; F. R. M. C. Society, late Surgeon of H. M. Ship Wilberforce, &c. London, 1843: pp. 216, 8vo.

The principal object of each of the above works, is to make us acquainted with the history of the remittent fever which prevailed so destructively on board the vessels belonging to the late unfortunate expedition to the Niger. Dr. McWilliam, the senior surgeon, before proceeding to a regular description of the disease, supplies us with a general account of the expedition, its progress, the precautions taken to avoid disease, the character of the climate, &c.

The grand object of the British government in sending an expedition to the Niger, was the extinction of the slave-trade, by means of commercial relations, which, it was hoped, might be established with the native chiefs, and by extending the benefits of Christianity and civilization to this degraded portion of the human race.

The expedition left England on the 12th of May, 1841, and entered the Niger on the 13th of August. A ventilating apparatus was fitted up in each of the iron steam-vessels composing the squadron, viz. the Albert, Wilberforce and Soudan, by which means not only a supply of fresh air could be kept up between decks, but the external atmosphere could be subjected to the action of chemical and other purifying agents before it was diffused below. The provisions were of excellent quality; the crews were carefully selected, a great proportion of them having already served in warm climates; and the most particular instructions were issued as regards dress, the avoidance of unnecessary or improper exposure, &c. The Delta of the Niger is described as a flat tract, composed of clay and sand, and in places containing minerals and much vegetable matter. This Delta extends to Aboh, a distance of 120 miles from the sea. The banks of the river are elevated only a few feet above its level, and the interior is swampy. From Aboh the land rises gradually as far as Iddah, but is still swampy and without rocks. Up to the period when the expedition reached this point, every thing seemed auspicious. The crews were in good condition, the Delta had been passed, and the vessels were entering the valley of the Niger under circumstances seemingly the most favourable. But on the 4th of September, three weeks after leaving the coast, fever of a most malignant character, says Dr. McWilliam, broke out in the Albert, and almost simultaneously in the other vessels. In a short time, the ravages of the disease were so great, that it became a question whether the whole of the squadron should be withdrawn for the season. Finally, however, it was determined that the Albert should proceed onwards, whilst the Wilberforce and Soudan returned to the open sea, with the sick on board. Accordingly, on the 21st of September, the Albert alone continued her course up the Niger, it being hoped that the climate of the more open country higher up would prove more wholesome; but by the 3d of October the effective force was so reduced, that, taken in connection with the fact that the water had already fallen considerably, it was resolved to withdraw from the river with all possible speed, which was accordingly done, and on the 16th, she regained the open sea, and on the following day reached Fernando Po, where the sick were landed.

The account of the fever drawn up by Dr. McWilliam, is principally based upon the cases which occurred on board the Albert, whilst that of Dr. Pritchett contains the substance of his official report relative to the fever which prevailed on board the Wilberforce. In noticing the principal points observed, we shall follow Dr. McWilliam, referring from time to time to the report of Dr. Pritchett.

The accession of the disease was commonly preceded by certain warning symptoms, such as headache, painful scintillations along the spine, with a feeling of coldness, or a sensation of weakness, and sometimes of burning heat in the epigastrium, followed by giddiness, lassitude, &c. The accession was usually marked by coldness, seldom accompanied by very decided shivering, whilst in the succeeding exacerbations, the skin became intensely hot, the headache more severe, the face flushed, the pulse rapid, but small and often feeble, thirst urgent, &c. The nausea was intolerable, the breathing difficult, the bowels constipated, and in general there was tenderness of the epigastrium. In the course of from three to six hours, the symptoms subsided, or were much abated, and diaphoresis came on; the perspiration in some cases, particularly the fatal ones, being characterized by a disagreeable odour. The sweating continued until from eight to twelve hours had been occupied by the whole paroxysm. Generally the accession returned in from six to twelve hours, though sometimes the respite extended to twenty-four, and in a few, there was a treacherous interval, in a very early period of the disease, of forty-eight hours. The evening was a more common time of accession than any other, but at the same time Dr. McWilliam informs us that they "did not seem to observe any law of periodicity. They came on, disappeared, and returned at all hours of the day and night." Dr. Pritchett, on the other hand, says that there was commonly a delusive remission towards morning, which continued till about noon, when the disease again recurred. As the disease declined, the recurrence of each attack was later and later every day, and the exacerbation less severe, whilst in bad cases, and as the affection increased in severity and danger, the remissions became of shorter duration, until they almost entirely ceased. In many cases, too, we are told by Dr. P., that the fever was so evidently worse on alternate days, that the circumstance was noticed by the patients themselves, who not unusually referred to their good and bad days.

Such were some of the principal features of this destructive malady; and one cannot fail to be struck with the remarkable similarity between it and the severe remittents of our own country. At the same time, we here find fresh proof of the fact, that, whatever may be the modifications induced by climate, the same disease is everywhere similarly characterized, so far as regards its more peculiar and essential symptoms.

Of the contingent symptoms, delirium is mentioned by Dr. McWilliam as a very bad one, 14 deaths having taken place out of the 21 cases in which it occurred. Neither *petechiæ* nor *sudamina* were observed in a single instance. Yellowness of the skin occurred in 19 cases, 13 of which were fatal, its average appearance being on the 9th day. Bilious vomiting was common in the early stage, and the attendant retching very troublesome, but in no case was there the slightest appearance of "black vomit."

In the fatal cases, death took place at various periods from the 3d to the 43d day; but the greater number occurred from the 7th to the 16th inclusive.

The account of the morbid appearances is much less satisfactory than that of the symptoms. From circumstances which could not be controlled, says Dr. McWilliam, the post-mortem examinations were by no means so numerous or scrutinizing as is desirable in the investigation of a disease whose causes and nature are comparatively so little known. His statements are based upon the examination of eight bodies.

In a portion of these only was the *head* examined. When it was, however, the dura mater was sound, and there was no subarachnoid effusion. In one case, the pia mater was red and injected, though whether to any considerable degree beyond the natural standard, is not mentioned. In one case, also, the amount of serum in the ventricles was larger than natural, whilst in two there was softening of the corpus callosum and walls of the ventricles. The brain, therefore, does not appear to have presented any very important lesion. The contents of the *thorax* also are stated to have been nearly always healthy in appearance.

Abdomen.—The peritoneum is said to have had, in general, a bilious tinge. The mucous coat of the stomach, which in some cases contained from one to five ounces of yellowish green fluid, was invariably softened, whether this fluid was present or not. Along with this, other pathological appearances, such as livid patches, were met with in some cases, and small points of ulceration were observed in three. Similar lesions, but much less marked, were met with in the duodenum; but, from this point, until within three feet of the end of the ileum, the intestinal canal was free from disease. But, in the portion of the ileum just mentioned, there was "softening of the mucous lining generally, and livid spots. A series of small ulcerations were seen in four cases. In one, the membrane was thickened, rough, and the ulcerations had nearly perforated the bowel: this case proved fatal by terminating in dysentery. The agminated glands of Peyer were distinct and enlarged in three cases."—McWilliam, p. 144.

Let us here pause to consider a remark made by Dr. McWilliam a little farther on, viz., that "the morbid appearances observed in the intestines are very like those so often found in fatal cases of the typhoid fever of this country." If this be so, he has signally failed in affording sufficient evidence to establish it. For, in the first place, as regards the glands of Peyer, the statement that these bodies were distinct and enlarged in three cases, proves nothing; since it is well known to those conversant with this branch of morbid anatomy, that these glands present, in the natural condition, very different degrees of development; so that in one case, they are only faintly perceptible, whilst in another they are remarkably distinct. The degree of development which coincides with the latter appearance, even granting it to be in some sense morbid, is far removed from that state of these bodies which is usually found in typhoid fever. Their consistence and colour, the state of their submucous tissue, &c., in the cases just mentioned, is not described, and this deficiency is alone sufficient to force us to the conclusion, that the statement in question is not supported by the facts adduced. But, more than this, the other circumstances mentioned tend positively to invalidate it. Thus, instead, as in typhoid fever, of the evidences of morbid alteration existing throughout the whole or a large part of the ileum, and even extending into the jejunum, we are told that in the cases before us, not only was the jejunum free from disease, but also the ileum until within three feet of its lower end, and even here the alterations were such only as are common to many affections, save in four cases, where small ulcerations were met with. Again, it should be observed, that in typhoid fever, the lesions of the large intestine are of secondary importance and quite subordinate to those of the small intestine. Thus, ulcerations of the former are met with in comparatively few cases, often confined to the cæcum, generally small, superficial, and limited in number, and most usual also in cases terminating at a late period of the disease. In the cases before us, on the contrary, we are told that "where lividity or ulcerated points were found at the lower end of the ileum, the same lesions were seen to exist on the arch of the colon." One of these cases, indeed, "proved fatal by terminating in dysentery." In short, it seems quite probable, that the intestinal ulcerations, in the cases before us, were dependent upon dysenteric disease which involved that portion of the ileum bordering upon the large intestines; an occurrence which not only seems very probable, but is quite in accordance with what we know of the pathological characters of the dysentery of hot climates. At any rate, the ulcerations in question were confined to that portion of the small intestine bordering upon the cæcum, were of small size, and distributed over the whole surface of the mucous membrane, instead of occupying especially the glands of Peyer, and, in one case, if not in more, coexisting with a perfectly healthy condition of these bodies, if we except their remarkable distinctness.

As in the four cases where ulcerations were met with, the patients, with one exception, died early, Dr. McWilliam concludes that the cause of the river fever "induces an unhealthy action in mucous surfaces much more rapidly than even the low typhoid fevers of France." In making this comparison, he adduces Chomel as authority for the statement that ulcerations do not take place in typhoid fever before the twentieth day, but he will find by a reference to this author, that he places their commencement at from the eighth to the twelfth day.*

As regards the spleen, Dr. McWilliam tells us that "in one case the spleen was enlarged, soft, and breaking down under the fingers; in another, enlarged, gorged with blood, but firm. This viscus was not altered from the normal condition in the other cases examined." If the state of the spleen was noted in all the eight autopsies, it would follow that this organ was healthy in three-fourths of the cases. By a reference to the histories of individual cases, reported at the end of the chapter, we find that in two, one of which proved fatal on the ninth and the other on the 10th day, the spleen is stated to have been enlarged and softened. In a third case, it was not altered, but it is here especially worthy of remark, that the patient died on the third, or at most the fourth day from the very outset; so that however important this fact, as going to show that the enlargement of the spleen is a consequence and not a cause of the disease, and requiring a certain time for its development, it by no means invalidates the position that there is in remittent fever a uniform tendency to the production of splenic engorgement. Of the two other cases, reported in detail, the spleen was enlarged and soft in one, its condition not particularly mentioned in the other. Neither of these cases, however, can be properly classed under the head of remittent, for in both the patients died of dysentery, which came on in one case about nine months after the attack of fever, and in another during protracted convalescence. By a reference to the account given by Dr. Pritchett, we find it stated, that the organ which "deviated in the greatest degree from the healthy condition, was the spleen, which was commonly enlarged and pulpy." In every fatal case which he reports in detail, three in number, the spleen is stated to have been enlarged, and in two of them pulpy. These cases died from the eighth to the eleventh day. It thus appears, that of the six fatal cases, given in detail in the works before us, the spleen was enlarged in every case but one, and that in this case the exception proves the rule, because of the very early period at which death took place. This result is entirely in accordance with the statement of Dr. Pritchett, but altogether at variance, as will be perceived, with the impression which the general assertion of Dr. McWilliam is calculated to convey. How far the unpublished cases might go to support the latter, we cannot say; but until we are informed of the period at which death took place and other circumstances, the general assertion must be considered as valueless.

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* Leçons de Clinique Médicale (Fièvre typhoide)—page 76.

As regards the liver, we find by a reference to the particular cases, that like the spleen, it was healthy in but a single case, the same which has been already referred to as having died at a very early period. In all the others, the colour appears to have been somewhat altered. By Dr. McWilliam it is reported as being gray, whilst Dr. Pritchett spoke of it as pale. Both agree in stating that it was more or less dry or anemic.

The gall-bladder appears to have been generally distended with bile, which was sometimes of the colour and consistence of tar.

Under the head of the *sequences* of the fever, Dr. McWilliam principally confines himself to the illustration of a point which, he thinks, does not seem to have engaged much attention, viz. the existence in the African fevers "of an irritability and great susceptibility of disease in the mucous lining of the bowels, for a long time after the cessation of the primary attack." In point of fact it appears that *colic* "is common among crews on the west coast of Africa, more especially among those who have suffered from fever;" amongst whom, it further appears, that "diarrhœa and dysentery are also frequent." It may fairly be doubted, however, whether these colicky and dysenteric affections are generally dependent "upon lesions of the mucous membranes of the bowels, which come on during the fever." Doubtless this is true of those cases in which there is accidental complication, particularly of dysentery, but as regards the others, it seems probable that the frequent occurrence of the diseases in question during or after convalescence, is rather to be attributed to a greater susceptibility to the operation of cold or other causes concerned in producing them, aided probably by the yet imperfectly restored condition of the liver, spleen, and perhaps the stomach, than to any pre-existing lesion of the mucous membrane of the bowels themselves, of the existence of which, as a proper concomitant or consequence of the fever itself, we do not see the evidence. Indeed, Dr. McW. himself seems to think that something like the explanation suggested above is admissible in a number of cases, for he says that—

"It often happens that the disorders referrible to the bowels do not appear, until convalescence from fever has considerably advanced. This is the period at which the patient is apt to throw off restraint. He neglects precaution as to clothing, and becomes less careful in his diet. The liver and other organs become deranged, the morbid secretions are poured out on the tender surface of the mucous membrane of the bowel, and disease in various forms is thus lighted up."—P. 154.

Intermittent was a very common sequence of the fever. Thus we are told, that "on board the Albert, none of those who had fever in the Niger, and were not at once sent to England, escaped intermittent." "In the Wilberforce," also, "nine cases of ague, following Niger fever, occurred during the passage to Ascension." The same cause, acting in different degrees of intensity, gives rise, Dr. McW. concludes, to both remittent and intermittent.

As regards the nature of this cause, the results of the experiments made during the expedition, are altogether of a negative character. In particular, much attention appears to have been paid, on reaching the coast, to the question of the existence of sulphuretted hydrogen in the waters, especially near the mouths of the rivers. Our readers are perhaps aware that Prof. Daniell, from the fact of having detected sulphuretted hydrogen in several bottles of water from near the mouths of rivers on the west coast of Africa, and the evidence of the action of the same agent upon the copper of the vessels, concluded that there was a probable connection between the evolution of this agent and the remarkable unhealthiness of the African coast. The most delicate tests, however, employed by the medical officers of the expedition, failed to give any evidence of the presence of sulphuretted hydrogen in the situations in question. When, however, the water was kept for some time in corked bottles, sulphuretted hydrogen was generated, owing probably to reaction between the sulphates and organic matter, in which putrefactive decomposition had commenced. Where the water was preserved in hermetically sealed bottles, some of which were sent to England and analyzed by Prof. Daniell, no sulphuretted hydrogen was generated. These experiments, as well as others performed on the African coast, seem to prove, conclusively, the absence of this gas from the river and sea waters of that region. But even had it been otherwise, and had this gas been detected in the water or atmosphere, it would still be far from being proved that it had any agency in the production of remittent fever, much less that it was the peculiar cause of that disease. Were this so, indeed, how could we possibly account for the fact that it does not generate the disease in the laboratory of the chemist and elsewhere, where individuals are often exposed to its concentrated action. Dr. Pritchett tells us that this gas was evolved on board the Wilberforce, on several occasions, to a very disagreeable extent, in consequence of the bursting of some cases of preserved meats, "but in no instance did any disease take place from this cause." But, although hitherto we have been unable to detect the presence of any peculiar deleterious agent as the cause of remittent, it does not hence follow that this disease is not owing to a specific poison. Because eudiometry has failed to detect the presence of the infectious principle of small-pox, measles, or scarlet fever, in the atmosphere, no reasonable man would hence doubt the existence there of such a poison. Its presence is clearly revealed by its effects, which cannot be accounted for by the ordinary causes of disease, such as cold, moisture, atmospheric vicissitudes, &c. Just as insufficient, we conceive, are the same causes to account for the production of remittent. Such, however, is not the view of Dr. Pritchett, who is disposed to regard the steady operation of heat and moisture upon the system, together with exposure to the sun's rays, as the great causes of the African remittent. Dr. McWilliam, on the contrary, adheres to the idea of malaria; and, after speaking of the peculiar exemption of the crews from the common causes of disease, (the whites being almost all men in the vigour of life, many of them having already served in warm climates, and all possible care being exercised in reference to diet, clothing, exposure, &c., the awnings being constantly spread so as to protect both from the sun and rain,) tells us that the atmosphere was in general far from being moist during the passage of the vessels up the Niger, that the dryness increased as they ascended, and, on the other hand, that from the mouth of the river to Iddah and Egga, they had slowly traversed "a country of a character recognized as eminently fertile in the production of fever. Swamps, in a rich alluvial soil, abounded. The islands and banks were everywhere more or less inundated."

A consideration of these circumstances, together with the fact that no sickness prevailed for twenty-three days after the vessels entered the mouth of the river, and sixteen days after commencing its ascent, at the end of which time, the fever broke out almost simultaneously on board all the vessels, and continued rapidly to increase, is clearly most in favour of the supposition of a miasmatic poison, which remains latent in the system for a longer or shorter time. As regards the period of incubation, it appears that the shortest period which could be assigned was 16 days, being the time, as above mentioned, when the vessels commenced the ascent of the river, and the longest 42, making the average period of attack on board the Albert, according to Dr. McWilliam, on the 25th day.

Of the whites belonging to the expedition, only fifteen escaped an attack of the disease in the Niger; whilst "of the blacks, consisting of natives of various parts of Africa, including Kroomen, Americans, West Indians of African origin, and East Indians, to the number of 158, eleven only were affected by the fever in the river." In these eleven cases, the disease was comparatively mild, and not fatal in a single instance. It is remarkable, that every one of the eleven thus attacked had been in England, and for some years absent from their native countries, showing, as Dr. McWilliam observes, that the immunity of the coloured races in warm countries, from endemic disease, is to a certain extent destroyed by a temporary residence in another climate.

The experience of the expedition, according to Dr. McWilliam, was decidedly opposed to the idea of one attack of the fever affording any protection against a second. Of those who had the fever on board the Wilberforce, many, he says, were again attacked, on the return of the vessel to the coast the following year, and when she proceeded up the Niger in July, six out of seven who had previously passed through the disease, were again seized.

Treatment.—Both the gentlemen whose works are before us, agree in the inefficacy of bleeding, in the fever of the West Coast of Africa. In the adynamic form which occurs in the rivers, general bleeding, says Dr. McWilliam, "is certain to do harm;" for although transient relief may be afforded, the remission is not prolonged, or the succeeding exacerbation diminished in severity, whilst there is less power of resistance. There is great danger, too, he says, of immediate depression by bleeding, so that the powers of reaction are more or less destroyed, and an asthenic condition produced, from which wine and stimulants will fail to rally the patients. Topical depletion was sometimes beneficial; but blisters and counter-irritants seem to have been more serviceable in relieving local affections. Blisters to the nape of the neck are spoken of as particularly useful in relieving cephalic disturbance, whilst sinapisms to the epigastrium generally checked the vomiting. Active purgation was resorted to at the outset; for which purpose, calomel followed by castor oil, or combined with jalap or bitartrate of potash, was commonly employed. Afterwards, mild laxatives only were made use of. Besides its purgative operation, calomel appears to have been generally resorted to, with a view to its constitutional effects; and although sometimes serviceable in this way, it does not, on the whole, seem to have answered the expectations entertained of it. Dr. McWilliam says that, in many cases, from the commencement, the vital energies were so low, that the full action of mercury would have been dangerous. Dr. Pritchett, who usually gave it in the early stages, in doses of from 5 to 10 grains every few hours, until the mouth was slightly affected, says that in several instances, where profuse ptyalism took place, the fever, contrary to what they had been led to expect, was not checked, but the disease seemed to continue more severe than ever, and, in one of the cases, proved fatal. Diaphoresis was favoured by mild measures. Dr. McWilliam found James's powder the best internal remedy for this purpose. The warm bath was thought to be generally contra-indicated in a disease marked by such tendency to sinking; and, in the few cases in which it was resorted to, was followed by no permanent benefit. Dr. Pritchett found that the best means of lessening the sense of burning heat, which was so commonly complained of, was to encourage the natural process of perspiration by keeping the body somewhat warmly wrapped up while the patient was inhaling the open air, as cool as it could be had. This plan was adopted, he says, from observing that an attempt to keep the surface cool by constant cold sponging, and removing the usual covering, rendered the skin dry and harsh, and the patient uneasy and nervous. On the other hand, the encouragement of free perspiration, in the manner just mentioned, evidently, says Dr. Pritchett, had a soothing effect upon the whole system.

Quinine, in large doses, was found by Dr. McWilliam to be of great benefit on the approach of convalescence. But he did not restrict its use to this period; for there were many cases, he says, in which, from the tendency to sinking from the very beginning, it was necessary to commence with quinine, wine, and light soups. No medicine, he further adds, was found so efficacious as quinine in diminishing the severity of the paroxysms.

The mortality of the disease was frightful. Of the blacks, as already stated, but few were attacked, and none died. But of the whites, 145 in number, 130 were attacked with fever in the river, of which number, 40, or rather less than a third, died either on board ship, or at the quarters to which they were afterwards conveyed. T. S.